Italian Botanist 3: 1–6 (2017)
doi: 10.3897/italianbotanist.3.12257
http://italianbotanist.pensoft.net

RESEARCH ARTICLE

Italian Botanist
Published by Società Botanica Italiana

Chromosome numbers for the Italian flora: 3

Lorenzo Peruzzi[1], Giovanni Astuti[1], Liliana Bernardo[2], Angelino Carta[1], Marco D'Antraccoli[1], Francesco Roma-Marzio[1], Monica Ruffini Castiglione[1]

1 *Dipartimento di Biologia, Università di Pisa, Via Derna 1, 56126 Pisa, Italy* **2** *Dipartimento DiBEST, Università della Calabria, 87036 Arcavacata di Rende (Cosenza), Italy*

Corresponding author: *Lorenzo Peruzzi* (lorenzo.peruzzi@unipi.it)

Academic editor: *G. Domina* | Received 13 February 2017 | Accepted 18 February 2017 | Published 27 February 2017

Citation: Peruzzi L, Astuti G, Bernardo L, Carta A, D'Antraccoli M, Francesco Roma-Marzio F, Ruffini Castiglione M (2017) Chromosome numbers for the Italian flora: 3. Italian Botanist 3: 1–6. doi: 10.3897/italianbotanist.3.12257

Abstract

In this contribution new chromosome data obtained from material collected in Italy are presented. It includes four chromosome counts for the following genera: *Bellevalia* (Asparagaceae), *Genista* (Fabaceae), *Linaria* (Plantaginaceae), and *Teucrium* (Lamiaceae).

Keywords

Cytogeography, cytotaxonomy, karyotype

How to contribute

Texts concerning new chromosome data should be submitted electronically to Lorenzo Peruzzi (lorenzo.peruzzi@unipi.it), including indications of voucher specimens and methods used.

Copyright *Lorenzo Peruzzi et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Chromosome counts

Bellevalia webbiana Parl. (Asparagaceae)

Chromosome number. $2n = 16$ (Fig. 1)

Voucher specimen. ITALY. Emilia-Romagna. Località Pergola, nei terreni dell'azienda agricola Lombardi (Faenza, Ravenna); margine di bosco mesofilo nei pressi di un oliveto, 144 m, 31 March 2016, *F. Roma-Marzio*, *G. Astuti* (PI).

Method. Squash preparations were made on root tips obtained from cultivated bulbs. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in 1N HCl at 60° C, the tips were stained in leuco-basic fuchsin. For karyotype reconstruction, four metapahasic plates were measured the KaryoType software (Altinordu et al. 2016), which was also used to match homologous chromosomes among plates and to build a mean haploid idiogram. Karyotype asymmetry was evaluated according to the parameters suggested by Peruzzi and Eroğlu (2013).

Observations. *Bellevalia webbiana* is a species endemic to a pre-Apennine belt between the administrative regions of Tuscany and Emilia-Romagna, where it occurs in the hills around Florence and Faenza, respectively (Gestri et al. 2010). This species is known to be tetraploid, possibly arisen from allopolyploidy (Borzatti von Loewenstern et al. 2013). However, chromosome counts were available for Tuscan populations only (Chiarugi 1949, Capineri et al. 1979, Maggini 1972) and no data for populations occurring in Romagna were reported so far. Hence, our count is the first for *B. webbiana* in this region and confirms the tetraploid asset of the species. The reconstructed karyotype (Fig. 1) and, consequently, the asymmetry indices, i.e., $CV_{CL} = 29.72$ and $M_{CA} = 31.08$, are also fully congruent with those available in the literature for Tuscan accessions (Chiarugi 1949, Maggini 1972, Borzatti von Loewenstern et al. 2013).

G. Astuti, M. Ruffini Castiglione

Genista tenorei G.Don (Fabaceae)

Chromosome number. $2n = 96$ (Fig. 2)

Voucher specimen. ITALY. Basilicata. Pollino Massif, Piano di Ruggio, 1 August 2016, *L. Bernardo, L. Peruzzi* (seeds collected in the field only; a specimen from the same locality, collected on 13 June 2013 by *L. Bernardo, D. Gargano*, is conserved in CLU n. 23782).

Method. Squash preparations were made on root tips obtained from germinating seeds. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in 1N HCl at 60° C, the tips were stained in leuco-basic fuchsin.

Figure 1. *Bellevalia webbiana* Parl., $2n = 16$. Metaphasic plate and haploid idiogram. Scale bar: 10 μm.

Figure 2. *Genista tenorei* G.Don, $2n = 96$. Scale bar: 10 μm.

Observations. *Genista tenorei* is endemic to Italy, limited to the Pollino Massif and belonging to the complex of *G. tinctoria* L. *Genista tenorei* is morphologically very similar to the SE European *G. depressa* M.Bieb. (Bernardo and Peruzzi 2016). This is

the first chromosome count for this species. Instead, for *G. depressa* a single $2n = 48$ count is available (Papanicolau 1984). Accordingly, our count seems to support the hypothesis of *G. tenorei* as a distinct species with respect to *G. depressa*. While $2n = 48$ is reported for several Italian localities of the related *G. tinctoria*, reports with $2n = 96$ chromosomes have also been published for this species from NW Italy (Forissier 1973, Cusma Velari et al. 2006) and Turkey (Esra et al. 2009).

F. Roma-Marzio, L. Bernardo, L. Peruzzi

Linaria purpurea (L.) Mill. (Plantaginaceae)

Chromosome number. $2n = 12$ (Fig. 3)

Voucher specimen. ITALY. Tuscany. Monte Calvi, (Livorno), near Villa Lanzi, 250–300 m, 22 May 2016, *D. Fontana* (seeds collected in the field only; a specimen from the same area, collected on 5 June 2010 by *L. Peruzzi, G. Gestri, B. Pierini, V. Lazzeri*, is conserved in PI).

Method. Squash preparations were made on root tips obtained from germinating seeds. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in 1N HCl at 60° C, the tips were stained in leuco-basic fuchsin.

Observations. *Linaria purpurea* is an endemic Italian species ranging from Emilia-Romagna to Calabria and Sicily (Peruzzi et al. 2014). Our chromosome count is the first from Tuscany and is in accord with all the previous counts derived from populations occurring in Sicily, Calabria and Umbria (Bedini et al. 2010 onwards).

A. Carta, M. D'Antraccoli, F. Roma-Marzio

Teucrium flavum L. subsp. *flavum* (Lamiaceae)

Chromosome number. $2n = 32$ (Fig. 4)

Voucher specimen. ITALY. Toscana. Calignaia (Livorno), nella macchia, 57 m, 29 June 2016, *F. Roma-Marzio* (PI, Herb. Roma-Marzio).

Method. Squash preparations were made on root tips obtained from germinating seeds. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in 1N HCl at 60° C, the tips were stained in leuco-basic fuchsin.

Observations. *Teucrium flavum* is an evergreen woody shrub whose range extends over the entire Mediterranean Basin, from the eastern coasts of Spain to Turkey (Lakušić et al. 2006). *Teucrium flavum* belongs to *T.* sect. *Chamaedrys* (Mill.) Schreb., including four subspecific taxa (Euro+Med 2006 onwards). The species within that section show

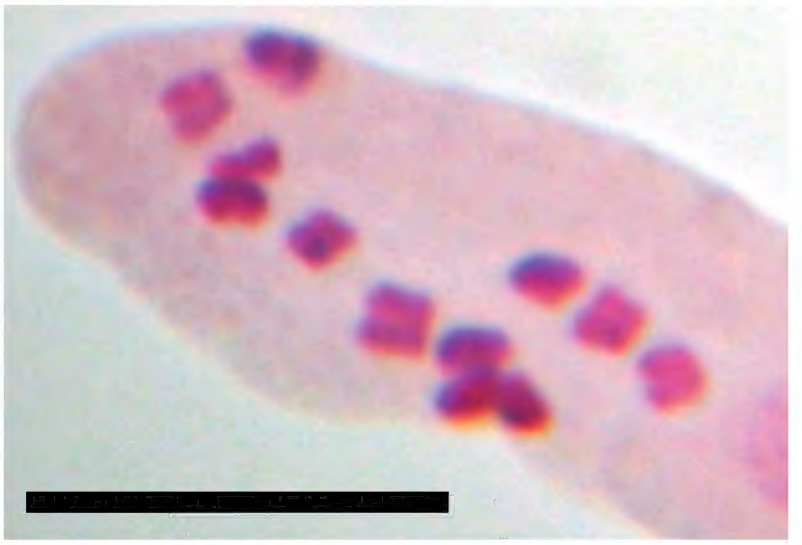

Figure 3. *Linaria purpurea* (L.) Mill., $2n = 12$. Scale bar: 10 µm.

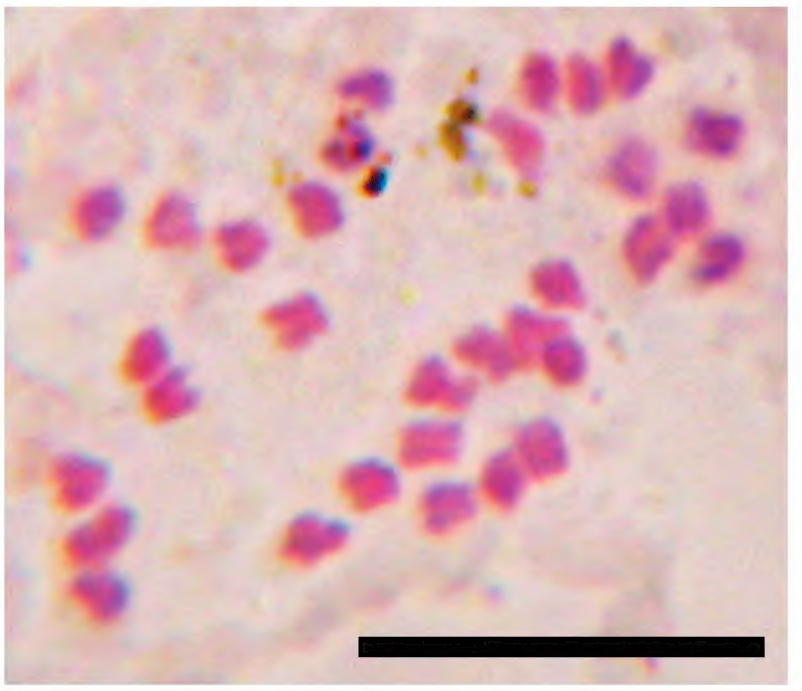

Figure 4. *Teucrium flavum* L. subsp. *flavum*, $2n = 32$. Scale bar: 10 µm.

different chromosome numbers, ranging from $2n = 28$ to $2n = 96$ (Özcan et al. 2015). However, all the previous counts for *T. flavum* report $2n = 32$ (Rice et al. 2014, Özcan et al. 2015). In Italy, only two counts are currently known, from populations occurring in Sicily and Latium (Bedini et al. 2010 onwards). Our count is the first for Tuscany and confirms the only known chromosome number reported for the species.

F. Roma-Marzio

Acknowledgements

The authors gratefully acknowledge the financial support by "Progetto di Ricerca di Ateneo" (PRA) of the University of Pisa, grant number PRA_2016_1, for the chromosome count of *Bellevalia webbiana*.

References

Altinordu F, Peruzzi L, Yan Y, He X (2016) A tool for the analysis of chromosomes: KaryoType. Taxon 65(3): 586–592. https://doi.org/10.12705/653.9

Bedini G, Garbari F, Peruzzi L (Eds) (2010 onwards) Chrobase.it – Chromosome numbers for the Italian flora. http://bot.biologia.unipi.it/chrobase/index.php [accessed 19 January 2017]

Bernardo L, Peruzzi L (2016) Dati preliminari su un'entità negletta della flora italiana: *Genista tenorei* (Fabaceae). Notiziario della Società Botanica Italiana 0: 7–8.

Borzatti von Loewenstern A, Giordani T, Astuti G, Andreucci A, Peruzzi L (2013) Phylogenetic relationships of Italian *Bellevalia* species (Asparagaceae), inferred from morphology, karyology and molecular systematics. Plant Biosystems 147(3): 776–787. https://doi.org/10.1080/11263504.2013.829884

Capineri R, D'Amato G, Marchi P (1979) Numeri Cromosomici per la Flora Italiana: 534–583. Informatore Botanico Italiano 10(3): 421–465.

Chiarugi A (1949) Saggio di una revisione cito-sistematica della flora italiana. I: tetraploidismo della *Bellevalia webbiana* Parl. e il suo diritto di cittadinanza nella flora italiana. Caryologia 1(3): 362–377. https://doi.org/10.1080/00087114.1949.10797519

Cusma Velari T, Feoli Chiapella L, Kosovel V, Patui S (2006) Numeri Cromosomici per la Flora Italiana: 1455–1459. Informatore Botanico Italiano 38(1): 185–189.

Euro+Med (2006 onwards) Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. http://ww2.bgbm.org/EuroPlusMed/ [accessed 19 January 2017]

Esra M, Muhittin D, Ahmet D, Bekir D, Erdogan EH (2009) Cytogenetical analysis of 12 taxa of *Genista* L. (Fabaceae) from Turkey. Bangladesh Journal of Plant Taxonomy 16(2): 151–156.

Forissier R (1973) Recherches cytotaxonomiques préliminaires sur les genre *Lembotropis*, *Cytisus*, *Chamaecytisus*, *Genista* e *Chamaespartium*. Bulletin de la Société Neuchâteloise des Sciences Naturelles 96: 51–65.

Gestri G, Alessandrini A, Sirotti N, Carta A, Peruzzi L (2010) Contributo alla conoscenza della flora vascolare endemica di Toscana ed aree contermini. 2. *Bellevalia webbiana* Parl. (Asparagaceae). Informatore Botanico Italiano 42(2): 449–455.

Lakušić B, Lakušić D, Ančić R., Stevanović B (2006) Morpho-anatomical differentiation of the balkan populations of the species *Teucrium flavum* L. (Lamiaceae). Flora 201: 108–119. https://doi.org/10.1016/j.flora.2005.05.001

Maggini F (1972) The chromosome complement of *Bellevalia dubia* (Guss.) R. et S. and the problem of *Bellevalia webbiana* Parl. Annali di Botanica (Rome) 31: 115–123.

Özcan T, Dirmenci T, Martin E, Altinordu F (2015) Cytotaxonomical study in five taxa of the genus *Teucrium* L. (Lamiaceae). Caryologia 68(1): 1–8. https://doi.org/10.1080/00087114.2014.996037

Papanicolau K (1982) *Genista depressa* M.Bieb. In: Löve A (Ed.) Chromosome number reports LXXXII. Taxon 33(1): 131.

Peruzzi L, Conti F, Bartolucci F (2014) An inventory of vascular plants endemic to Italy. Phytotaxa 168(1): 1–75. https://doi.org/10.11646/phytotaxa.168.1.1

Rice A, Glick L, Abadi S, Einhorn M, Kopelman NM, Salman-Minkov A, Mayzel J, Chay O, Mayrose I (2014) The Chromosome Counts Database (CCDB) a community resource of plant chromosome numbers. http://ccdb.tau.ac.il/home/ [accessed 19 January 2017]